

REMARKS

Claims 1-26 are pending in the application. Claims 1-13, 22-24 and 26 are rejected. Claims 14-21 and 25 have been allowed. Claims 1, 5, 13, 14, 19, 22, 23, 25 and 26 are amended. New claim 27, which corresponds to a QCM sensor device according to the fourth embodiment, has been added.

Claim Rejections - 35 U.S.C. § 112

Claims 5-11, 22-24 and 26 are rejected under 35 USC 112, second paragraph, as being indefinite. The Examiner identifies specific instances of alleged indefiniteness and, in some cases, proposed amendments to overcome the indefiniteness. On the basis of the accompanying amendments and the following comments, this rejection is traversed for at least the following reasons.

Claim 5 - The Examiner finds “the electrodes” to be vague at line 2. Appropriate clarification has been made by stating that with respect to the electrode pairs recited in claim 1, “each of a plurality of said electrode pairs forms an oscillating domain.”

Claim 13 – The Examiner finds that the phrase “the substrate” and the phrase “the piezoelectric transducer” lack antecedent basis in claim 1. Applicant submits that this claim should have depended from claim 12, which does provide the proper antecedent, and has amended the claim accordingly.

Claim 19 – The Examiner finds the reference to “the substrate” to be indefinite as the antecedent intended is not clear. Applicant has amended the claim to remove a double recitation of “substrate” and to thereby refer to the substrate in parent claim 14 for antecedent.

Claim 22 – The Examiner asserts that it is not clear whether the measuring unit measures information from one or more transducers. Applicant has amended the claim to refer to “at least one.” Also, grammatical changes suggested by the Examiner have been made.

Claim 23 – grammatical suggestions by the Examiner have been adopted.

Claim 26 – The Examiner asserts that the reference to “the sample” is indefinite because of prior reference to such “sample” in claims 25 and 26. Applicant has amended the claim to clarify the reference to the sample.

On the basis of the foregoing amendments, Applicant believes that the claims should overcome the rejection and that at least claims 6-11 are now allowable.

Claim Rejections – 35 USC 102

Claims 1-5 and 12-13 are rejected under 35 USC 102(b) as being anticipated by either Katoh (4,818,959) or Taniguchi (6,819,203). These rejections are traversed for at least the following reasons.

The present invention, as defined by independent claim 1 comprises a quartz crystal microbalance (QCM) sensor that detects an amount of a substance. The QCM sensor comprises a plurality of piezoelectric transducers, each piezoelectric transducer having a pair of electrodes including a first electrode and a second electrode. Moreover, each piezoelectric transducer has a respective resonance frequency and is adapted to adsorb said substance and change a resonance frequency.

These features do not appear in the prior art cited by the Examiner. Indeed, neither prior art reference mentions the words “quartz,” “crystal” or “microbalance,” and neither has a mention of QCM. Moreover, neither reference mentions a capability of the piezoelectric transducer to have a resonance frequency that changes in response to absorbed substances.

While these features did appear in the preamble of claim 1, the Examiner previously did not give the preamble of claim 1 any patentable weight since the Examiner has taken the position that no weight is to be given to the preamble if some correspondence does not appear in the body of the claim.

Applicant has amended claim 1 so that it now expressly states corresponding limitations of the preamble in the body of the claim. In particular, the claim now states that each piezoelectric transducer has a respective resonance frequency and is adapted to adsorb said substance and change a resonance frequency. This feature is clearly tied to the function of a

QCM sensor, based upon the comprehensive teachings of the specification and figures. Accordingly, Applicant respectfully submits that the claim is not anticipated.

Katoh

Katoh does not teach a QCM sensor with a plurality of piezoelectric transducers, each piezoelectric transducer having a respective resonance frequency and being adapted to adsorb said substance and change a resonance frequency. While the Examiner has pointed to the transducers 5, 6 as corresponding to the transducers of claim 1, these transducers do not have a respective resonance frequency and are not adapted to absorb a substance and change the resonance frequency. Indeed, the transducers are part of a first resonator 5 having a piezoelectric ceramic substrate 51, as taught at col. 3, line 65, and a second resonator 6 having a piezoelectric ceramic substrate 61. At col. 4, line 36, Katoh mentions that the ceramic resonator has a piezoelectric substrate 1 with a pair of electrodes 2 and 3 as shown in FIG. 8A. However, this and other reference to the piezoelectric structure are limited to a ceramic device and have no mention of a sensitivity of resonance frequency to detected substances.

Taniguchi

Taniguchi also does not teach a QCM sensor with a plurality of piezoelectric transducers, each piezoelectric transducer having a respective resonance frequency and being adapted to adsorb said substance and change a resonance frequency. Again, the Examiner has pointed to the transducers P1, P2 as corresponding to the transducers of claim 1, but these transducers do not have a respective resonance frequency and are not adapted to absorb a substance and change the resonance frequency.

Indeed, as is evident from the disclosure at col. 2, line 27-col. 4, line 26, Taniguchi is primarily concerned with the structure of a ladder circuit type surface acoustic wave filter device that includes a piezoelectric substrate, a plurality of parallel arm resonators and a plurality of series arm resonators provided on the piezoelectric substrate which are respectively defined by surface acoustic wave resonators, and a plurality of inductors connected in series to the parallel arm resonators.

Amendment under 37 C.F.R. § 1.111
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In sum, both Katoh and Taniguchi fail to teach or disclose a QCM sensor including a plurality of piezoelectric transducers having respective resonance frequencies, and being adapted to absorb substance and change resonance frequency. The elements in Katoh and Taniguchi, which the Examiner regards as piezoelectric transducers, fail to have features of having respective resonance frequencies, and being adapted to absorb substance and change resonance frequency.

On the foregoing basis, claim 1 should be found patentable over each of Katoh and Taniguchi. Further, the dependent claims 2-5 and 12-13 should be found patentable as well.

Allowable Claims

Claims 14-26 have been allowed and claims 6-11 should be allowable with the removal of the rejection under Section 112, paragraph 2. Moreover, claims 1-5 and 12-13 also should be allowable on the basis of the amendment and argument presented to the Examiner.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

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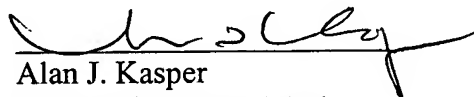
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